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Notes on the embryo-sac of *Passiflora adenophylla*

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(WITH PLATE 19)

While in Cuba, about two and a half years ago, the writer had occasion to make a study of the characters of the embryo-sacs and embryos of a number of tropical plants. While pursuing this work attention was called to *Passiflora adenophylla* Mast.* which was growing luxuriantly in the botanical garden of the Agricultural Experiment Station at Santiago de las Vegas. Unfortunately, a sufficient amount of material for a complete study was not secured before leaving the island. However, the facts brought out by the study were so interesting that it has been considered advisable to present them at this time.

The early stages in the formation of the embryo-sac were not observed. The four-nucleate stage (FIG. 1) did not vary from the usual form. It was about twice as long as broad and the two nuclei at the micropylar end were somewhat larger than the two at the antipodal end. In the eight-nucleate stage (FIG. 2) the sac had elongated to about three times the length of the four-nucleate sac and the antipodal half was considerably narrower than the other half. The egg was considerably larger than the two synergids, the antipodals were well defined and the two polar nuclei unite near the egg (FIGS. 2 and 4).

The pollen-tube is very prominent (FIGS. 3, 6, and 7) and the two sperm-nuclei are clearly visible after their escape into the sac (FIG. 3). Double fertilization was very evident (FIGS. 4 and 5) and was observed in a great many preparations. In fact the writer has never examined plants in which double fertilization was so conspicuous.

However, the most interesting feature of this study was the peculiar behavior of the pollen-tube, which, as previously stated, was very prominent. In the majority of cases it does not discharge its nuclei but continues its growth within the sac, eventually

* Determined by Dr. J. N. Rose, of the National Museum, Washington, D. C., where a specimen has been deposited. It is a native of Brazil.

filling it (FIGS. 6, 7, and 8) and becoming very much twisted and tangled in the process. The growth of the tube seems to be so vigorous that its entrance into the embryo-sac usually results in the complete absorption of the egg-apparatus (FIGS. 6 and 7) and eventually of the entire contents of the sac. In those cases in which the tube does not burst, the egg-apparatus begins to disintegrate immediately upon the entrance of the tube (FIGS. 6 and 7). The sac then enlarges and the tube makes a vigorous growth, enlarging in both diameter and length and eventually filling the sac with a very much tangled mass (FIG. 8), which apparently draws its nourishment from the nucellus. It stains very deeply with haematoxylin. In the material from which this study was made, this condition was the rule and not the exception. It appears that the parasitic nature of the pollen-tube in these cases has developed in excess of the usual manner and that instead of performing the function usually performed by this organ, it really prevents the formation of the embryo.

In some instances the pollen-tube acted in the usual manner (FIGS. 3 and 4) and several cases were observed in which the egg had the appearance of having been fertilized (FIG. 4). A satisfactory study of the embryo was impossible because of the lack of material.

A number of sacs were observed in which a non-cellular endosperm had been formed (FIG. 9). In no case was the endosperm and an abnormal pollen-tube observed in the same sac.

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Explanation of plate 19

FIG. 1. Four-nucleate embryo-sac.

FIG. 2. Eight-nucleate embryo-sac.

FIG. 3. Micropylar end of the sac, showing the egg, the pollen-tube and two sperm-nuclei.

FIG. 4. Micropylar end of the sac, showing the fertilized egg, the two polar nuclei in the act of uniting, and one sperm-nucleus.

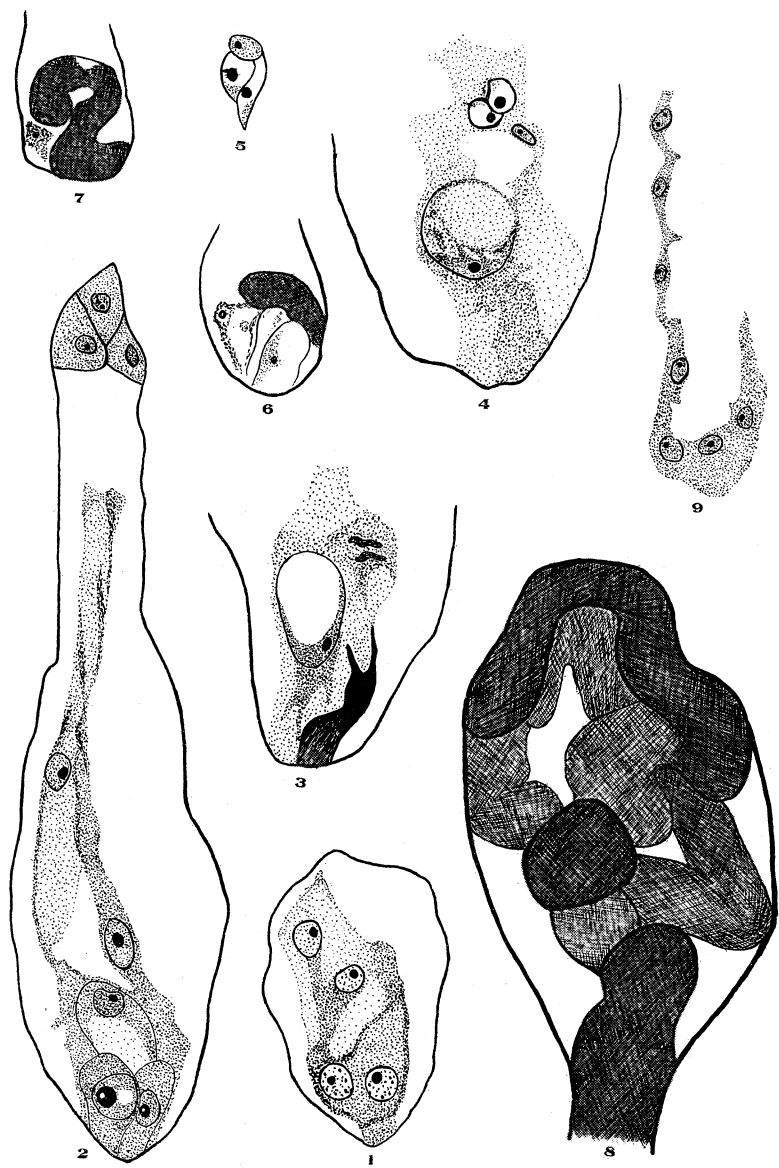
FIG. 5. Union of the two polar nuclei and one sperm-nucleus.

FIG. 6. Micropylar end of the embryo-sac, showing the entrance of the pollen-tube without rupturing, and the egg-apparatus in early stage of disintegration.

FIG. 7. Micropylar end of the embryo-sac, showing later stage in the growth of the tube and the further disintegration of the egg-apparatus.

FIG. 8. Later stage in the development of the embryo-sac, showing it almost entirely filled by the excessive growth of the pollen-tube.

FIG. 9. The endosperm.



COOK, EMBRYO-SAC OF PASSIFLORA ADENOPHYLLA